CLAIMS

1. A method of exposing a planar cross-section of a structure composed of a first material, the method comprising:

depositing a layer of a second material on said structure, said second material having mill rates at higher incidence angles that closely approximate the mill rates of the first material at those incidence angles;

directing an ion beam at the structure;

milling the structure in order to expose a cross-section of the structure thereby producing a uniformly planar face on said exposed cross-section.

2. The method of claim 1 in which said second material has mill rates at incidence angles greater than 75 degrees that closely approximate the mill rates of the first material at incidence angles greater than 75 degrees.

3. The method of claim 2 in which said second material has mill rates at incidence angles greater than 75 degrees that that are equal to or slightly greater than the mill rates of the first material at incidence angles greater than 75 degrees.

4. The method of claim 1 in which said second material has mill rates at incidence angles greater than 45 degrees that closely approximate the mill rates of the first material at incidence angles greater than 45 degrees.

5. The method of claim 4 in which said second material has mill rates at incidence angles greater than 45 degrees that that are equal to or slightly greater than the mill rates of the first material at incidence angles greater than 45 degrees.

6. The method of claim 1 in which said structure comprises a write-head for a magnetic disk system.

7. The method of claim 1 in which said first material comprises an alloy of Ni and Fe.

8. The method of claim 1 in which said second material comprises carbon.

9. A method of exposing a non-planar cross-section of a structure composed of a first material, the method comprising:

depositing a layer of a second material on said structure, said second material having mill rates at higher incidence angles that do not closely approximate the mill rates of the first material at higher incidence angles;

directing an ion beam at the structure;

milling the structure in order to expose a cross-section of the structure thereby producing a non- planar face on said exposed cross-section.

10. The method of claim 9 in which said second material has mill rates at incidence angles greater than 75 degrees that do not closely approximate the mill rates of the first material at incidence angles greater than 75 degrees.

11. The method of claim 10 in which said second material has mill rates at incidence angles greater than 75 degrees that are substantially lower than the mill rates of the first material at incidence angles greater than 75 degrees.

12. The method of claim 9 in which said second material has mill rates at incidence angles greater than 45 degrees that do not closely approximate the mill rates of the first material at incidence angles greater than 45 degrees.

13. The method of claim 12 in which said second material has mill rates at incidence angles greater than 45 degrees that are substantially lower than the mill rates of the first material at incidence angles greater than 45 degrees.

14. The method of claim 9 in which exposing a non-planar cross-section of a structure comprises exposing a recessed cross-section face.

15. A method of measuring a dimension of a cross-section of a structure composed of a first material, the method comprising:

depositing a layer of a second material on said structure, said second material having mill rates at higher incidence angles that closely approximate the mill rates of the first material at those incidence angles;

directing an ion beam at the structure in order to expose a planar cross-section of the structure and said layer of a second material;

directing an electron beam at the planar cross section;

determining the edge positions for the desired dimensions of the cross-section; and

determining the distance between said edge positions.

16. The method of claim 15 in which said second material has mill rates at incidence angles greater than 75 degrees that closely approximate the mill rates of the first material at incidence angles greater than 75 degrees.

17. The method of claim 16 in which said second material has mill rates at incidence angles greater than 45 degrees that are equal to or slightly greater than the mill rates of the first material at incidence angles greater than 45 degrees.

18. The method of claim 15 in which said second material has mill rates at incidence angles greater than 45 degrees that closely approximate the mill rates of the first material at incidence angles greater than 45 degrees.

19. The method of claim 18 in which said second material has mill rates at incidence angles greater than 45 degrees that are equal to or slightly greater than the mill rates of the first material at incidence angles greater than 45 degrees.

20. The method of claim 15 in which said first material comprises an alloy of Ni and Fe.

21. The method of claim 15 in which said second material comprises carbon.

22. The method of claim 15 in which directing an ion beam at the structure in order to expose a planar cross-section of the structure and said layer of a second material, comprises focused ion beam milling.

23. The method of claim 15 in which determining the edge positions on cross-section comprises forming an image of said cross-section on an image forming device and applying an algorithm to assign an edge position based upon gray-level variations.

24. A method of choosing a first material to be deposited as a protective layer on a structure composed of a second material prior to milling in order to control topological variation of a cross-section of said structure, the method comprising:

determining the desired cross-section topography;

determining the approximate mill rate of the second material at higher incidence angles;

selecting a first material from known materials having a mill rate at higher incidence angles that will produce the desired topography of the cross-section face.

25. The method of claim 24 in which the desired cross-section topography comprises a uniformly planar cross-section face.

26. The method of claim 25 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 75 degrees

that closely approximate the mill rates of the first material at incidence angles greater than 75 degrees.

27. The method of claim 26 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 75 degrees that are equal to or slightly greater than the mill rates of said second material at incidence angles greater than 75 degrees.

28. The method of claim 25 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 45 degrees that closely approximate the mill rates of the first material at incidence angles greater than 45 degrees.

29. The method of claim 28 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 45 degrees that are equal to or slightly greater than the mill rates of said second material at incidence angles greater than 45 degrees.

30. The method of claim 25 in which selecting a first material from known materials comprises:

selecting a preliminary group of materials from known materials with mill rates at higher incidence angles that closely approximate the mill rates of said second material at higher incidence angles;

determining the electron emission coefficient of said second material;

determining the electron emission coefficient of each selected preliminary material; and

selecting from said preliminary group, an appropriate first material having the greatest relative difference in electron emission coefficient as compared to said second material.

31. The method of claim 30 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 45 degrees that closely approximate the mill rates of the second material at incidence angles greater than 45 degrees.

32. The method of claim 30 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 75 degrees that closely approximate the mill rates of the second material at incidence angles greater than 75 degrees.

33. The method of claim 24 in which the desired cross-section topography comprises a non-planar cross-section face.

34. The method of claim 33 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 45 degrees that do not closely approximate the mill rates of the first material at incidence angles greater than 45 degrees.

35. The method of claim 33 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 75 degrees that do not closely approximate the mill rates of the first material at incidence angles greater than 75 degrees.

36. The method of claim 24 in which the desired cross-section topography comprises a recessed cross-section face.

37. The method of claim 36 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 45 degrees

that are that are substantially lower than the mill rates of said second material at incidence angles greater than 45 degrees.

38. The method of claim 36 in which selecting a first material from known materials comprises selecting a first material having mill rates at incidence angles greater than 75 degrees that are that are substantially lower than the mill rates of said second material at incidence angles greater than 75 degrees.

39. A method of measuring the width of a structure composed of permalloy, the method comprising:

coating the structure with a layer of carbon;

directing a charged particle beam at the structure in order to expose a planar cross-section;

directing an electron beam at the cross-section; and

measuring the width of the structure cross-section.

40. An apparatus for measuring a dimension of a cross-section of a structure composed of a first material, the apparatus comprising:

a means for depositing a layer of a second material over the structure, said layer of a second material having mill rates at an incidence angles greater than 75 degrees that closely approximate the mill rates of the first material at incidence angles greater than 75 degrees;

a means for milling a cross-section of the structure;

a means for imaging the cross-section of the structure; and

a means for measuring the distance between two or more boundaries between the first and second materials.

41. A semiconductor structure comprising:

a structure formed from a first material;

a layer of a second material covering the structure;

said second material having mill rates at incidence angles greater than 75 degrees that closely approximate the mill rates of the first material at incidence angles greater than 75 degrees; and

an exposed vertical cross-section of said structure and said layer.